



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/708,426	03/02/2004	Jei-Ming Chen	NAUP0519USA1	2425

27765 7590 02/01/2005

NORTH AMERICA INTERNATIONAL PATENT OFFICE (NAIPC)
P.O. BOX 506
MERRIFIELD, VA 22116

EXAMINER

LUU, CHUONG A

ART UNIT	PAPER NUMBER
----------	--------------

2818

DATE MAILED: 02/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Applicati n N .

10/708,426

Applicant(s)

CHEN ET AL.

Examiner

Chuong A. Luu

Art Unit

2825

-- The MAILING DATE f this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION
PRIOR ART REJECTIONS

Statutory Basis

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The Rejections

Claims 1-6 are rejected under 35 U.S.C. 102(e) as being anticipated by
Rajagopalan et al. (U.S. 6,656,840 B2).

Rajagopalan discloses a microelectronics device with

(1) providing a semiconductor layer (402);

depositing a dielectric layer (408, 414) disposed on the semiconductor wafer (402), the dielectric layer (408, 414) having a main surface and a damascened recess (471, 472) on the main surface (see Figure 2a);

depositing a copper layer (421) in the damascened recess (471, 472) and to fill the damascened recess (471, 472) (see column 7, lines 60-67. Figure 2c);

performing a chemical mechanical polishing process to polish the copper layer (421) such that the copper layer (421) has an exposed upper surface substantially co-

Art Unit: 2825

plane with the main surface of the dielectric layer (408, 414) (see column 8, lines 7-27.

Figures 2c-2e);

capping the exposed upper surface with a bi-layer capping film (424a, 424b) consisting of a lower HDPCVD silicon nitride layer (424a) and an upper doped silicon carbide layer (424b) (see column 9, lines 30-66; column 11, lines 13-45. Figure 2f);

(2) wherein after polishing the copper layer to form the upper surface and before capping the exposed upper surface with the bi-layer capping film, the upper surface is pre-treated by hydrogen or ammonia plasma for reducing residual copper oxide on the upper surface (see column 8, lines 31-67);

(3) wherein the hydrogen or ammonia plasma pre-treatment is carried out at a temperature of below 300°C for a time period of about 10 seconds to 60 seconds (see column 8, lines 55-67; column 9, lines 1-27 and column 13, lines 39-67);

(4) wherein the lower HDPCVD silicon nitride layer is formed by high density plasma chemical vapor deposition (HDPCVD) at a temperature of below 350°C (see column 9, lines 29-67);

(5) wherein the upper doped silicon carbide layer is composed of oxygen doped silicon carbide (SiCOH) or nitrogen doped silicon carbide (SiCNH) (see column 11, lines 13-45 and column 12, lines 1-31);

(6) wherein the upper doped silicon carbide layer is produced by a chemical vapor deposition (CVD) process, in which 3-methyl silane or 4-methyl silane is used as a precursor (see column 12, lines 1-11 and column 13, lines 12-20).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chuong A. Luu whose telephone number is (571) 272-1902. The examiner can normally be reached on M-F (6:15-2:45).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Chuong Anh Luu
Examiner
January 28, 2005